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The impact of market competition and patient classification on Dutch hospital behavior

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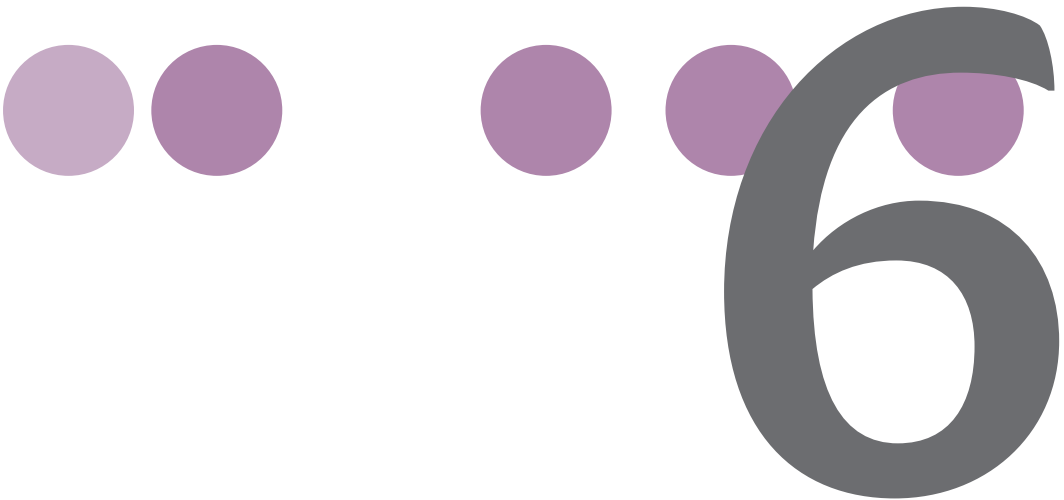
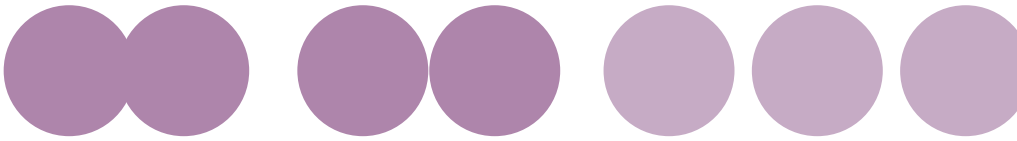
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Summary and conclusions



The Dutch government has introduced managed competition into the health care system to deal with continuously increasing health care costs. Comprehensive health care reforms have been implemented to develop a level playing field in which health care providers and health care insurers can freely negotiate on price, volume and quality of different care products, which is intended to lead to lower prices and higher quality. The central question of this dissertation is: How have hospitals responded to payment incentives under the new reimbursement system in order to stimulate competition? This dissertation evaluates the reimbursement system and gives an insight in the first effects of market competition on volume and cost in the Dutch hospital sector.

All studies in this dissertation used DBC data and activity data that were registered within the period 2005-2009 and originate from the national DBC information system. Data were made available by the Dutch Association of Hospitals (NVZ). The first part of this dissertation focuses on the Diagnosis Treatment Combinations system (DBC system) as an instrument to achieve more transparency by defining health care products and to support negotiations between hospitals and health insurers. In the second part of the dissertation, the effects of market competition on volume and costs in different research settings are examined.

The implementation of a new compensation system for the Dutch cure sector, the DBC system, is independently developed from the internationally well-known Diagnosis Related Group system. This unique and newly designed system is based on design choices made by scientific committees of the medical professions. This new design resulted in an extremely fine-grained case mix system with more than 40,000 different DBC codes. In theory, fine-grained systems may provide more accurate product cost information than coarse-grained systems do. However, measurement errors, aggregation errors and specification errors reduce cost systems accuracy and these errors may even be enlarged by the high number of product codes in the DBC system.

We evaluated whether the refinement of the DBC system leads to more reliable cost information. We analyzed the performance of the DBC system on cost-effectiveness, within product homogeneity and predictive validity, by comparing this system with more aggregated case mix systems. The DBC system does not appear to be very cost-effective, because 70% of the cases contain less than 30 observations. Moreover, only 15% of the DBC codes explain 96% of total costs. For the diagnoses classification this is different: 40% of the codes explain 96% of total costs. The level of cost-effectiveness differs between medical specializations. In fact, the DBC system consists of 24 separate systems developed by the different medical professions. Most DBC-codes (between 50% and 98%, depending on the specialization) have been developed for outpatient and daycare treatments. That is surprising, because these settings have much lower cost variability compared to inpatient treatments. Formal tests show that more fine-grained classification systems have a higher cost homogeneity and a better predictive

validity than more coarse-grained classification systems, like the diagnoses-based classification system. This finding is also confirmed when we compare our results of the predictive validity of the DBC-system with the predictive validity of DRG-systems found in other studies (see table 2.8). Part of the result of the DBC system, however, is caused by the exclusion of many cases and case mix groups because of low-volume groups and outlier problems. A large number of low volume groups suggest that the casemix system is not cost-effective, while outlier problems indicate the existence of measurement problems. Using more fine-grained cost systems for inpatient care episodes, and less case mix groups for outpatient settings, would perhaps have led to improved cost information and a more cost-effective case mix system. The new DOT system is a considerably less fine-grained system, containing around 4,400 different case mix groups, and it uses the internationally accepted ICD-10 diagnoses classification system. In the DOT structure a decision tree based on care activities is used to determine the DOT care product. Although this procedure is very different from the one used for the DBC system, the DOT classification for the high-volume health care products used in Chapters 4 and 5 appear to be very similar to the DBC care products. For example, more than 99.5% of the cases of the DBC “total hip replacement” can be found in the corresponding DOT care product. Whether the DOT system performs better than the DBC system in terms of cost-effectiveness, within-group homogeneity and predictive validity, still has to be examined in future research.

The second study of the DBC system compares the detailed DBC resource consumption information with a proxy for resource consumption that is generally used in the literature: the length of stay (LOS). The newly created DBC system offers the first opportunity in the Netherlands to accurately measure hospital production and resource consumption. This information allows us to test whether LOS is a reliable proxy for hospital resource consumption. The results show that LOS is a poor proxy for resource consumption. The average elasticity of the sample DBC codes is 0.577, which means that changes in LOS lead to considerably less than proportionate changes in costs. For half of our sample care products, the relationship between cost and LOS is not consistent over time and varies between the observation years. The weak relationship between cost and LOS indicates that resources are not evenly consumed over the length of a patient's stay. The unstable relationship over observation years for half of the sample DBCs suggests that over time, the case mix may vary and that different treatments or technologies are used. These cause temporary differences in resource consumption patterns. The results imply that the regression coefficient of LOS as an independent variable to explain variation in a dependent variable, e.g. quality or volume, cannot be interpreted as the marginal effect of cost variation on the dependent variable.

In the second part of the dissertation, the effects of market regulation on hospital DBC volumes and cost of care are analyzed. Competition in health care markets and especially hospital markets is an important research topic in the health

economics literature. Much research has been done in the US and the UK because these countries have a long history in hospital competition. Prior to the 1980s, US hospitals and physicians were reimbursed on fee-for-service and patients were free to choose their hospital. This resulted in a more patient-driven competition where providers provided extra and even unnecessary services to attract patients, which led to increasing health care expenditures. To control health care costs, new financial incentives were introduced in the Medicare and Medicaid program in the US. Similar reforms have been introduced in the UK in later years. Hospitals were reimbursed on a prospective payment system, free provider choice became restricted and insurers were allowed to selectively contract health care providers. The focus of competition in health care markets changed from patient driven competition to provider competition. Although research showed a decrease in health care costs, the reforms appeared to have a negative impact on the quality of care. With the reintroduction of free provider choice in the UK in 2006, the introduction of a prospective payment system (Payment-by-Results) with fixed prices and financial incentives for excellent performing hospitals (Foundation Trust Status) competition among hospitals is now focused on quality in the UK. Also in the Netherlands financial incentives have been introduced in the health care system. A framework, including the Health Insurance Act, the Health Care Institutions (Accreditation) Act (WTZi) and the Health Care Market Regulation Act (WMG) were developed in which hospitals and insurers compete about price, volume and quality of hospitals products. This framework consists of several conditions for consumers, purchasers and providers. Consumers must have a mandatory basic health insurance package and have the freedom to buy this package at a private health insurer. Consumers can switch every year from health insurer. Health insurers must accept all consumers for the basic health insurance and therefore risk selection is prohibited. On behalf of their consumers they must efficiently purchase health care. They are therefore allowed to selectively contract providers. This means that providers have the risk to lose contracts. Providers and health insurers negotiate about price, volume and quality of care. To support the negotiations between hospitals and health insurers a patient classification system based on transparent hospital products (DBC system) is needed. Hospitals are not the only providers in the hospital market because the government allows new providers such as Independent Treatment Centers to enter the market.

However, previous research showed that during the first years after the reforms the system was not working as the government had expected (Schut & Van de Ven, 2011; Boonen & Schut, 2010; Maarse & Paulus, 2011). For example, quality information was hardly available, hospitals and health insurers had not much experience in free negotiations on price, only a small part of the hospital products was eligible for market competition and the complex classification system did not effectively support the negotiation process. The market coordination will lead to higher price elasticity of demand, which is expected to lead to lower prices and price-cost margins of hospital products. This in turn will motivate health care providers to control costs. When hospitals are reimbursed on a prospective

payment system, it is expected that hospitals will increase their production volume in a competitive market because an increase in the volume will directly increase their income.

The studies in the second part of this dissertation focus on the market competitive part of the DBC system: the B segment. In this dissertation two alternative approaches have been followed to study the impact of market regulation on hospital behavior. The first approach is a longitudinal study of the impact of the implementation of market coordination. Because price competition has been gradually implemented in the Dutch health care sector, this 'natural experiment' facilitates the application of a difference-in-difference approach to a set of DBCs that are jointly responsible for 25% of the production in the B2 and B3 segments (see Chapter 4). With a difference-in-difference model we compare a treatment and a control group on volume and costs before and after the introduction of competition. The matching of experimental DBCs with a control group of non-identical DBCs with similar characteristics is not a straightforward decision, because of the multidimensionality of DBC traits that may be relevant in the comparison with the experimental DBCs.

In order to test the robustness of the diff-in-diff analysis, we also followed an alternative methodology to study the impact of market coordination on hospital behavior. The alternative approach is a cross-sectional study of a different group of 15 health care products representing approximately 70% of all health care costs in the market-based payment system. This study assesses the impact of differences in hospital market concentration on health care volume and costs on individual DBC level. The selected DBCs are since 2005 part of market competition. Regions with a high concentration of hospitals are considered less competitive than markets with low hospital concentration. The difference between highly competitive regions, like the Randstad, and low-competitive regions, like East-Groningen, reflects the differential impact of high and low market pressures on health care volumes and costs.

The descriptive statistics and the time coefficients of the diff-in-diff study show that, over the years the hospital sector has increased production and decreased average costs for most of the selected diagnoses, but increased the average number of activities. However, if we analyze the empirical results of the difference-in-difference model, we find that the introduction of competition has led to different effects for the health care groups included in our study. The introduction of market competition has led to lower volume in daycare treatments, and to lower care intensity and average costs in outpatient treatments. Inpatient treatments show an increase in average costs, which indicate that more expensive care activities are used under conditions of market competition. The effects of market competition also differ between the two medical specializations included in the study. The introduction of market competition for orthopedics led to a substitution of daycare by outpatient care and inpatient care, with a resulting

increase in average costs. In cardiologic treatments, we see a substitution of inpatient care by daycare treatments and a decrease in average costs.

Also the descriptives of the cross-sectional study presented in Chapter 5 found, with some exceptions, an increase in the production of DBCs since the introduction of market coordination. The volume increase, however, is not affected by a concentration of insurers, suggesting that health insurers are unable to control volume by selective contracting. Our results show that no general conclusions can be drawn about the impact of market coordination on health care volume and costs. Moreover, most of the effects found are specialization specific. For most health care products we find that more competition between hospitals (in regions with relatively low hospital concentration) lead to higher costs. Apparently, under the new quasi-market system, both hospital and physician are able to maximize income by increasing health care production. Insurers do not seem to use their monopsony power because higher insurer concentration is associated with higher average costs for most of the selected DBCs.

Also, more Independent Treatment Centers (ITC) offering the same health care product leads to higher hospital costs and lower hospital production. This could be explained by ITCs taking the simpler cases, leaving hospitals the more complex cases. Diabetes DBCs form a specific group within our sample selection and show different results. This can be explained by the specific agreements between market parties and the introduction of a bundled payment system for diabetes care, which resulted in a substitution of diabetes care from hospitals to primary care. Differences between DBCs can also be explained by the nature of specific DBCs: some DBCs have more possibilities to shift from inpatient to daycare treatment (i.e. adenoids and hernia). Other DBCs provide more opportunities to intensify treatments (i.e. arthroplasty and varices).

Although this dissertation shows in the descriptives in Chapter 4 and Chapter 5 a volume increase in all market segments (B1, B2 and B3 segments), for most of the DBCs and in all general hospitals, this is not a result of the introduction of market coordination. Neither the transfer of products from the budget system to the market competitive system, nor hospital concentration and insurer concentration has an impact on the production volume of hospitals. Because the research period of this dissertation is relatively short, the contribution of the exogenous patient demand is limited. An explanation could be found in the abolishment of the lump sum system. In the market competitive system both hospital and physicians are able to maximize income by increasing health care production. The way hospitals and physicians increase their production could depend on the type and price-cost margins of DBCs or the possibility to extend the indication for treatments. Further research is needed to help understand hospital and physician behavior.

Chapter 4 shows lower average costs for most outpatient and daycare DBCs and higher average costs for inpatient (orthopedic) DBCs after the introduction of

market competition. However, these results appear in concentrated markets rather than competitive markets (chapter 5). Both studies cannot give a clear explanation of these results. This dissertation shows that the impact of market competition differs per specialty, per diagnosis, per treatment setting and even per DBC. Therefore it is not possible to draw general conclusions.

In summary, this dissertation shows only limited—and sometimes contradictory—effects of what the government expected of market competition. The results in this dissertation represent an initial exploration of the effects of competition for Dutch hospitals on volume and cost, but more research is needed. The health care sector and more specifically, the hospital sector, is in a transition phase. The DBC system has been changed to a new system—the DOT care products, which was an improvement in several ways. Because the B segment has expanded to 70%, future research can examine the effects of competition on a macro level.

The Dutch government focuses in her Coalition Agreement on three important plans: First, the government wants to improve the quality of care by increasing the transparency of quality information. Second, the government wants to control health care cost by decreasing over capacity and unnecessary treatments. Third, the government tries to stimulate cooperation between health care providers by concentrating expensive and complex care (Regeerakkoord, 2012). This means that the objectives of the government have not been changed over the years, however the government has developed these goals further in policy proposals such as selective contracting obligation for health insurers and the introduction of combined tariffs for hospitals and medical specialists in 2015. This means that the hypotheses in this dissertation do not change and the results could be more significant.

There are different interesting topics for this future research. First, quality information is necessary for a competitive healthcare market to work properly and therefore outcome and quality measures must be available to all decision makers. An important question that needs to be answered is the impact that public disclosure of quality information has on volume, costs and quality of hospital care. More research on quality competition has become available in the last years. Most of the studies examine quality in hospital markets where prices are determined such as the UK National Health Service (e.g. Gaynor et al, 2010) or US Medicare system (e.g. Kessler and McClellan, 2000). There are also studies that examine quality in hospital markets when prices are free (e.g. Propper, 2004). Research in the Dutch health care market may contribute to this literature because prices in this market are both set by the government and by the market and a direct comparison between the sub systems is possible. Second, it is important to analyze the impact of Independent Treatment Centers on hospital behavior because the introduction of the ITC has definitely changed the hospital market structure. There is hardly any empirical literature about the impact of new providers on the hospital market (Gaynor & Town, 2012). Research about the Dutch hospital market may contribute to this research.

More European countries have plans to introduce market incentives into their health care systems to increase competition and to control health care costs. The Dutch system is a unique case because of the combination of solidarity and privatization. Research on the Dutch system can therefore produce relevant results for other countries in reaching their objectives for efficient care giving at affordable prices that is accessible for all citizens.

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